

# Status and Recent Validation Results

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# Validation Topics

- Topical Collection in Journal of Geophysical Research on AIRS validation
  - In contact with JGR editors
  - Titles welcome
- Some recent results on AIRS validation
  - Scan-angle dependence of SST (D. Hagan)
  - Statistical comparisons with ECMWF (S. Leroy)
  - Global variability in comparisons with ECMWF (Fetzer & E. Olsen)
  - Ozone-humidity covariability at 300 mb (Bill Irion and collaborator Andrew Gettelman).

## JGR Topical Collection on AIRS Validation

- The Rules
  - Need 10 or more articles
  - Reviewed like any other JGR article
  - Journal needs reviewers
  - Tight publication schedule / deadlines
  - Manuscripts likely due spring / summer
    - *No firm due dates until we propose a topic*
    - *I would like to do so in early November*

## JGR Topical Collection on AIRS Validation

- Some titles
  - *Cloud-cleared radiances*, Evan Fishbein, et al.
  - *The AIRS Water Vapor Experiment*, D. Whiteman, et al.
  - *Experiments in Support of AIRS Validation*, Robert Atlas et al.
  - *SST Validation*, D. Hagan, et al.
  - *Temperature Profile Validation*, E. Fetzer et al.
  - *Short Term Variations at ARM sites*, B. Lesht et al.
  - *Case Study of Water Vapor*, C. B. Farmer, et al.
  - *Overview of AIRS Validation*, Fetzer and McMillan
  - *Microwave Radiative Transfer Model Validation*, P. Rosenkranz
  - *AIRS/AMSU/HSB Cloud Liquid Water Validation*, P. Rosenkranz
  - *The ABOVE Experiment*, Wallace McMillan, et al.
  - *Water Vapor Validation with Sondes and GPS*, McMillin and Yoe
  - *Validation with SHIS*, Revercomb, Tobin, others

## JGR Topical Collection on AIRS Validation (con't)

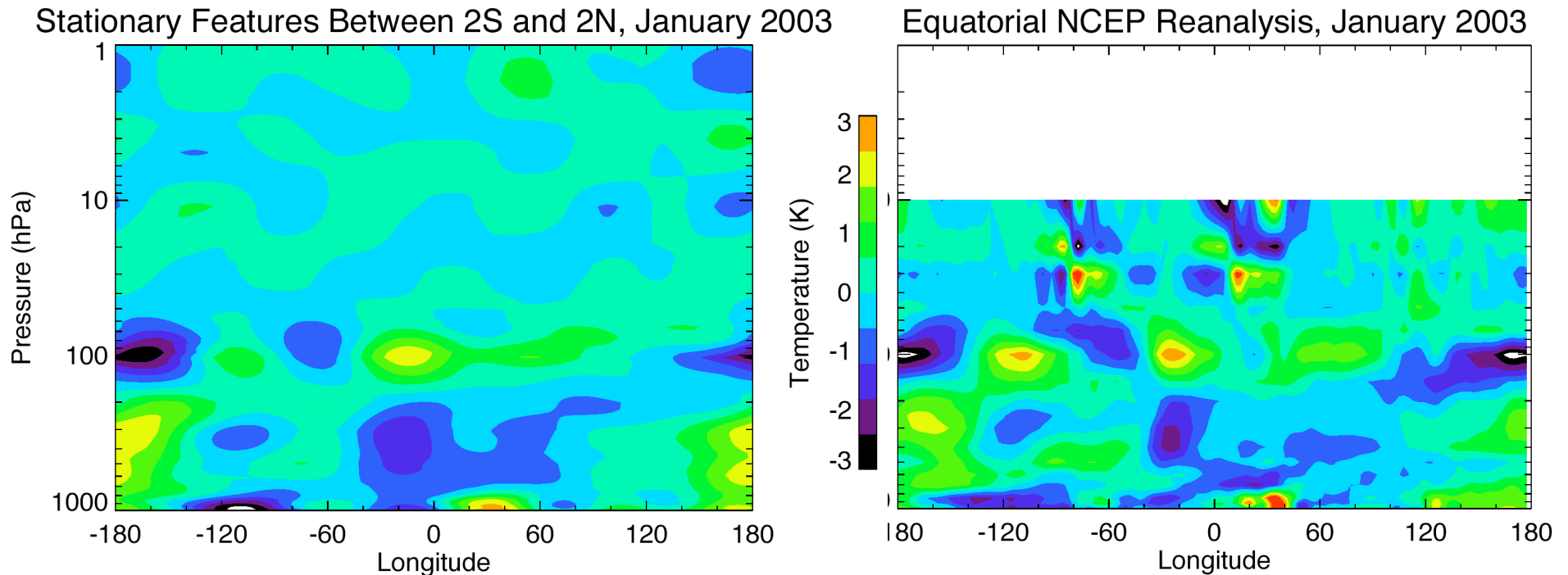
- More titles:
  - *Comparison of AIRS, MODIS, CERES on Aqua*, Tobin, et al.
  - *ARM Best Estimates*, Tobin, Revercomb, Strow, others
  - *Val. of AIRS Land Surface Emissivity*, Knuteson, et al.
  - *AIRS validation in Antarctica*, Walden, et al.
- I hope...
  - *Ozone Results*, Mike Newchurch, et al.
  - *Forward Model Validation*, Strow et al.
  - *Radiances and SST*, Aumann et al.
  - *Mauna Loa / Hilo Observations*, J. Barnes, H. Voemel
  - Others...
- Expect
  - More pestering emails and phone calls in the next few weeks.
  - A tight schedule, with more pestering emails and phone calls.

## What We've Done and What We're Doing

- August Validation Report
  - Statistical comparisons over oceans  $\pm 40$  degrees.
- More Recently: Exploratory Data Analysis
  - A wide variety of analyses
    - Zonal mean structure and deviation (S. Leroy looking for Kelvin waves).
    - SST vs. scan angles and cloud top temperature (D. Hagan)
    - Global analyses of granules
    - Global maps of interrelated quantities (Ed Olsen)
    - Small scale structures
      - The topic of tomorrow's talk.

## A Recent Result: AIRS-NCEP2 (Stephen Leroy)

### Deviations from zonal mean along the equator

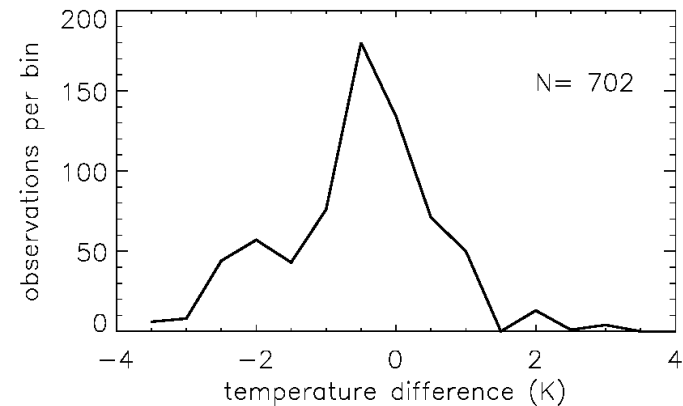
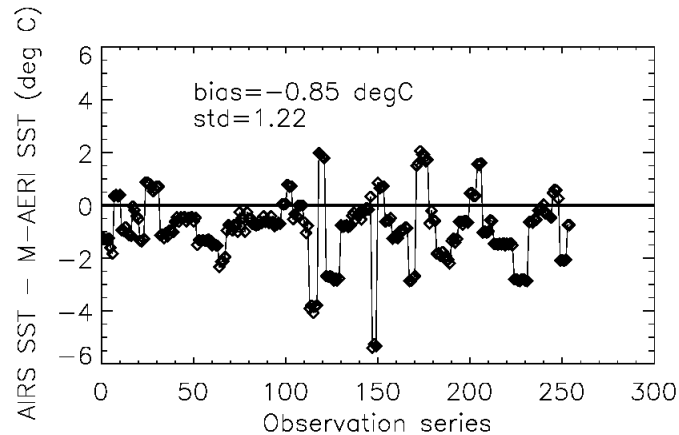
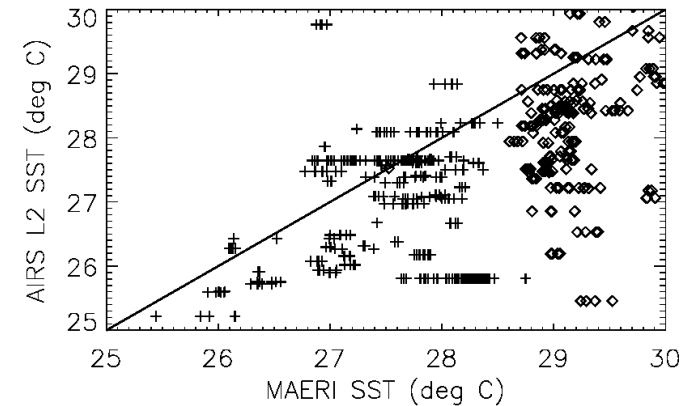
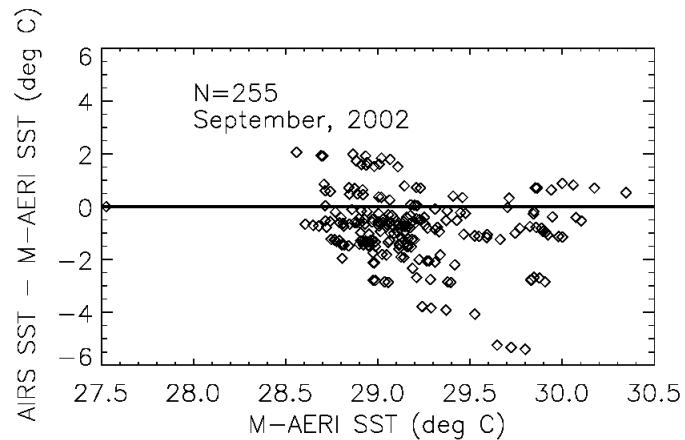


This significant result confirms long-term stability.

# DENISE HAGAN: AIRS L2 Cloud-cleared SST versus M-AERI SST

from Caribbean *Explorer of the Sea*

M-AERI data courtesy of Peter Minnett, RSMAS



Sept 1 through Sept 30

September and December Data

In tropics , AIRS L2 SST agrees on average with M-AERI to within  $\sim 0.5^{\circ}\text{C}$

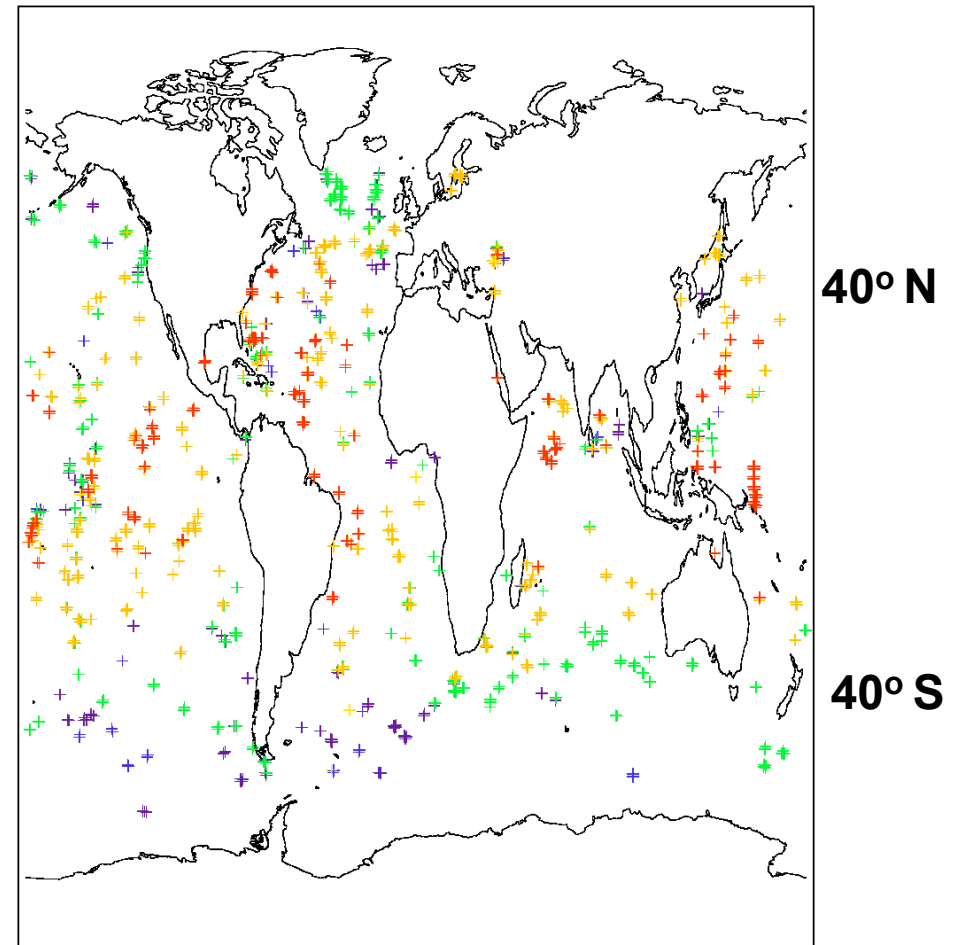
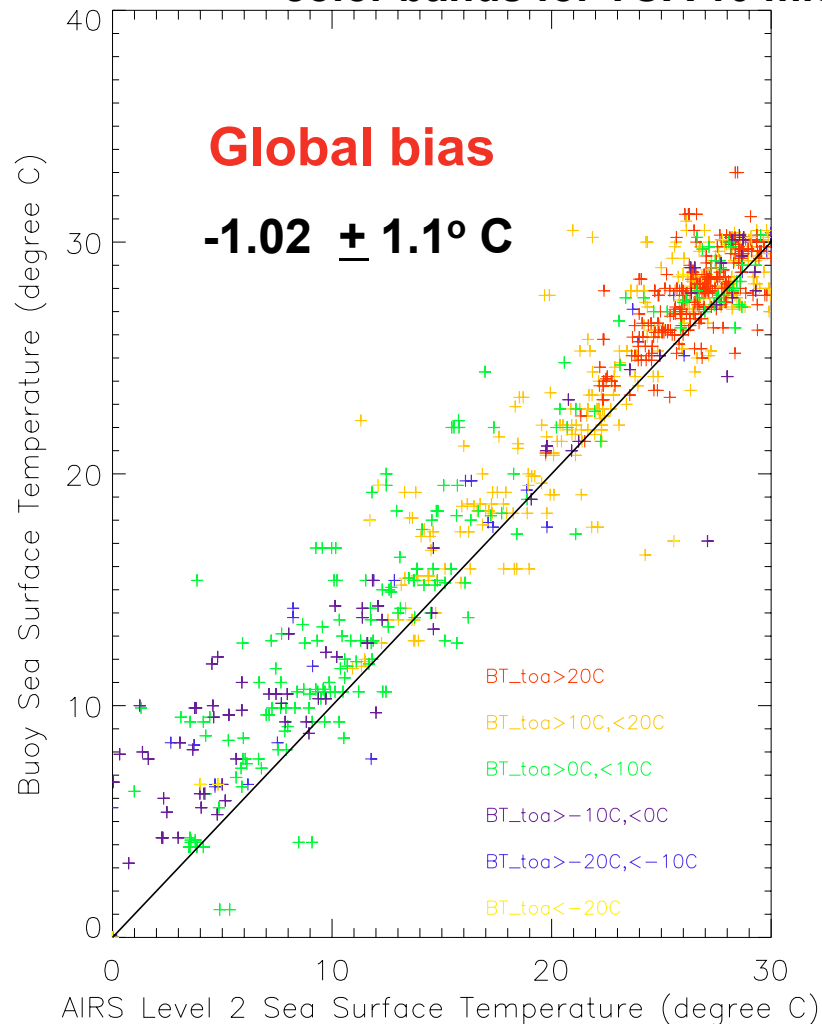
D. Hagan, JPL



## AIRS L2 *Cloud-cleared* SST vs Buoy SST

SST validated 40° N to 40°S (*Beta Version* GSFC DACC Data)

color bands for TOA 10 micron brightness temperatures



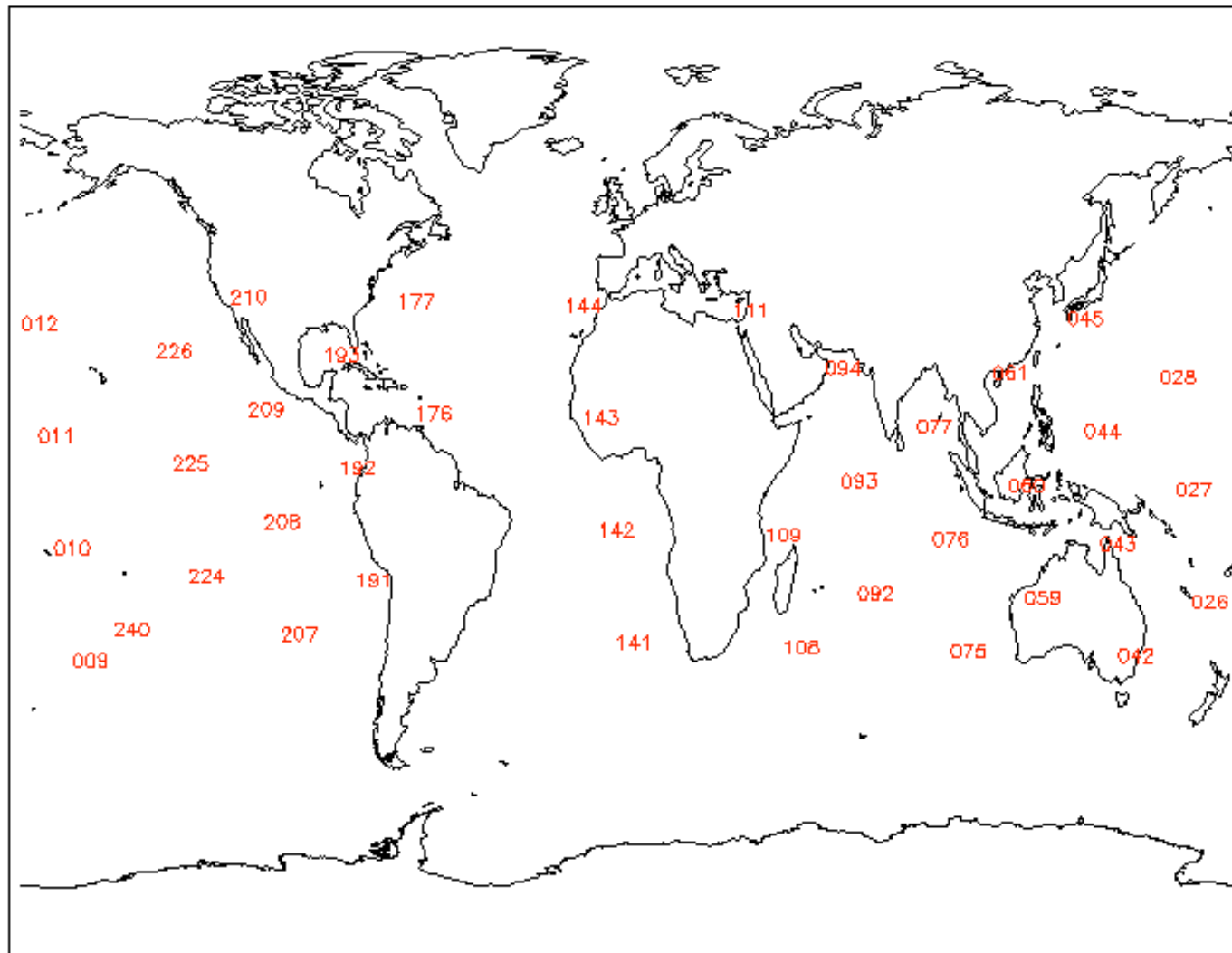
**In tropics, SST retrieved from very cold (cloudy) footprints are within 1 K of surface truth**

D. Hagan, JPL

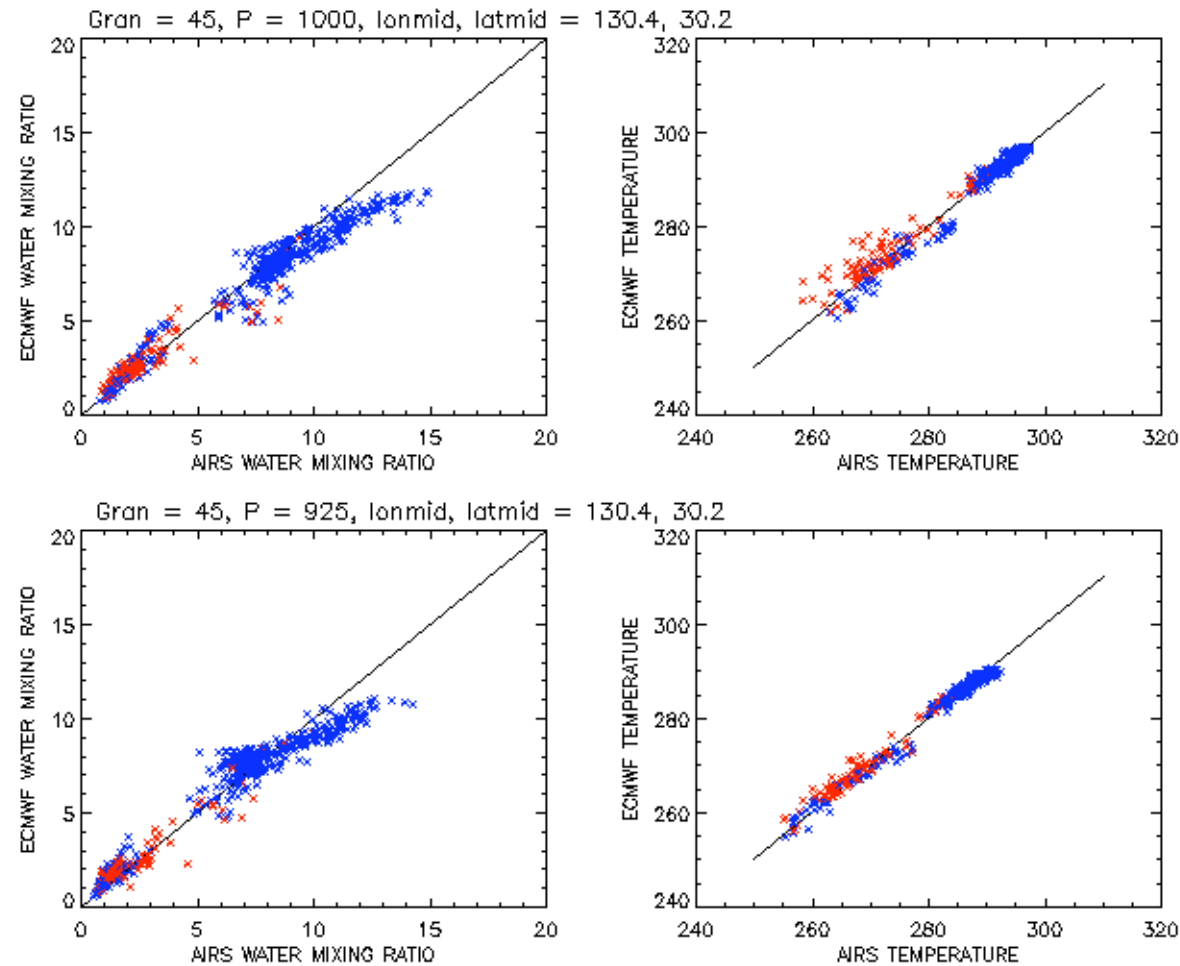
## Global Variability in Comparisons with ECMWF

- The Procedure:
  - Consider only retrieval\_type =0 cases
  - Consider only daytime ocean granules  $\pm 40$  lat, January 3
    - Sun glint, but with Vis/NIR diagnostics
  - Calculate scatterplots of AIRS vs. ECMWF for T and q.
  - Color code (red) points with deviations from NCEP SST by  $>3$  K
  - Focus initially on lowest levels
    - ...because that's where retrieval errors are largest
- The Result
  - Several regimes are seen

## Granule Locations on January 3

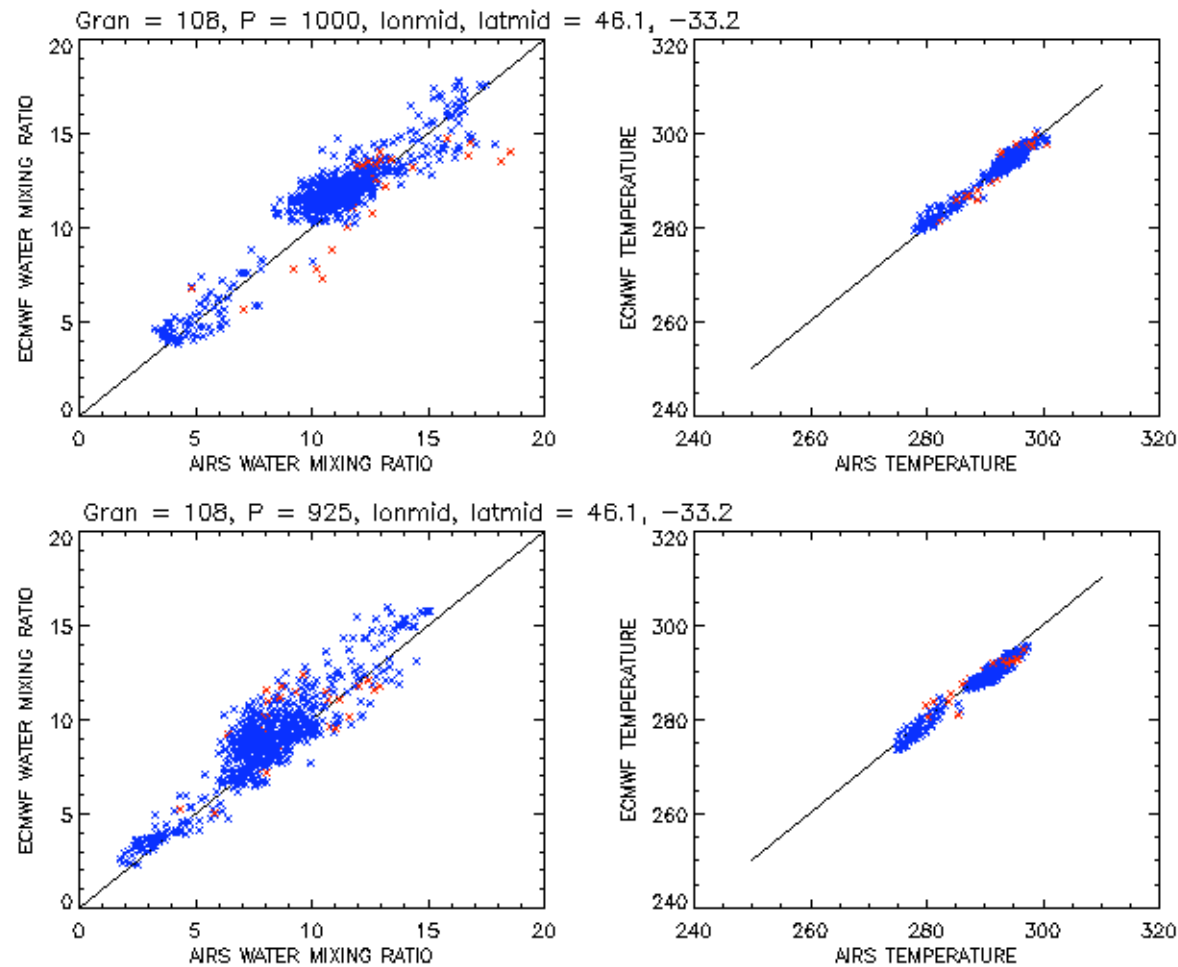


## Regime 1: Midlatitude Storm Tracks



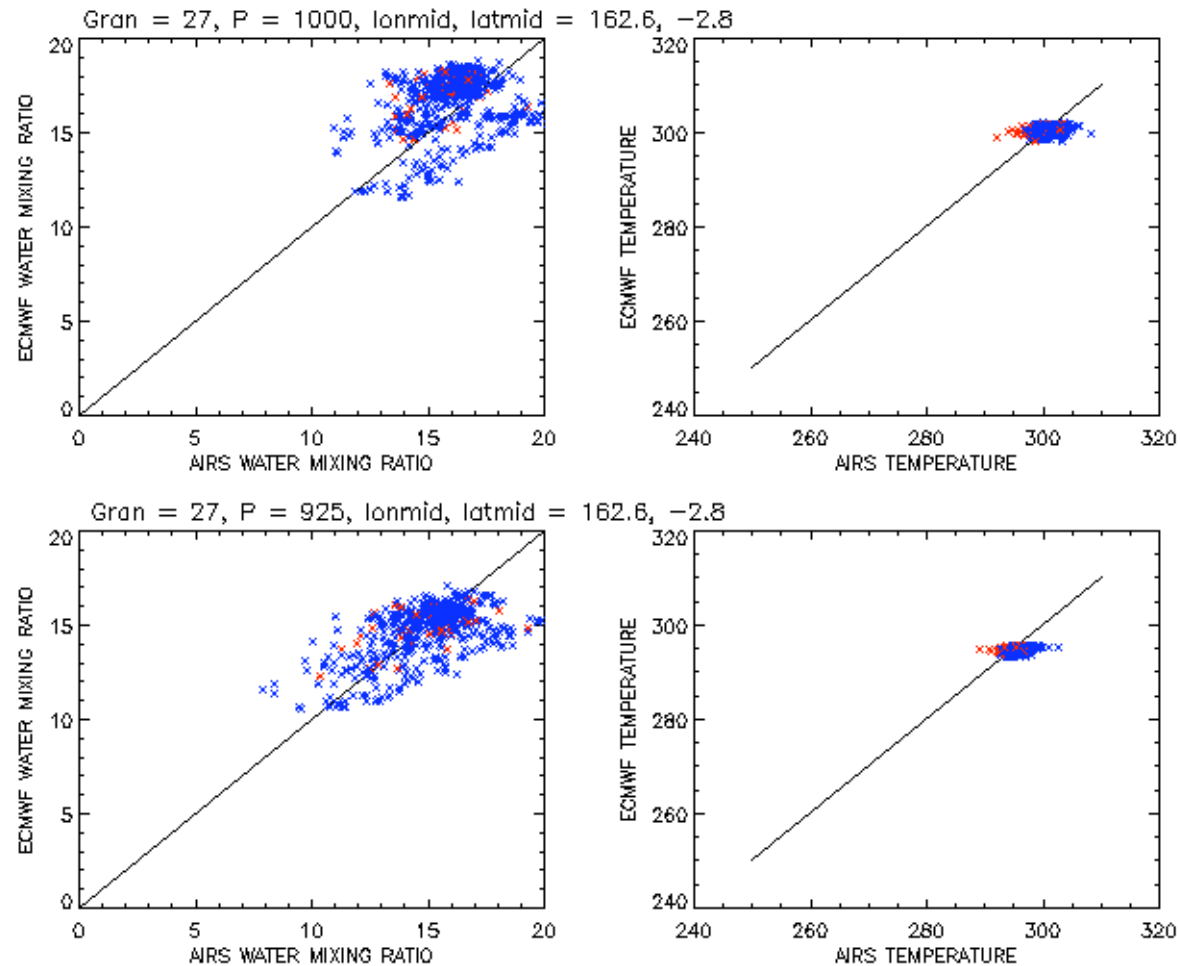
South of Japan

## More Midlatitude Storm Tracks



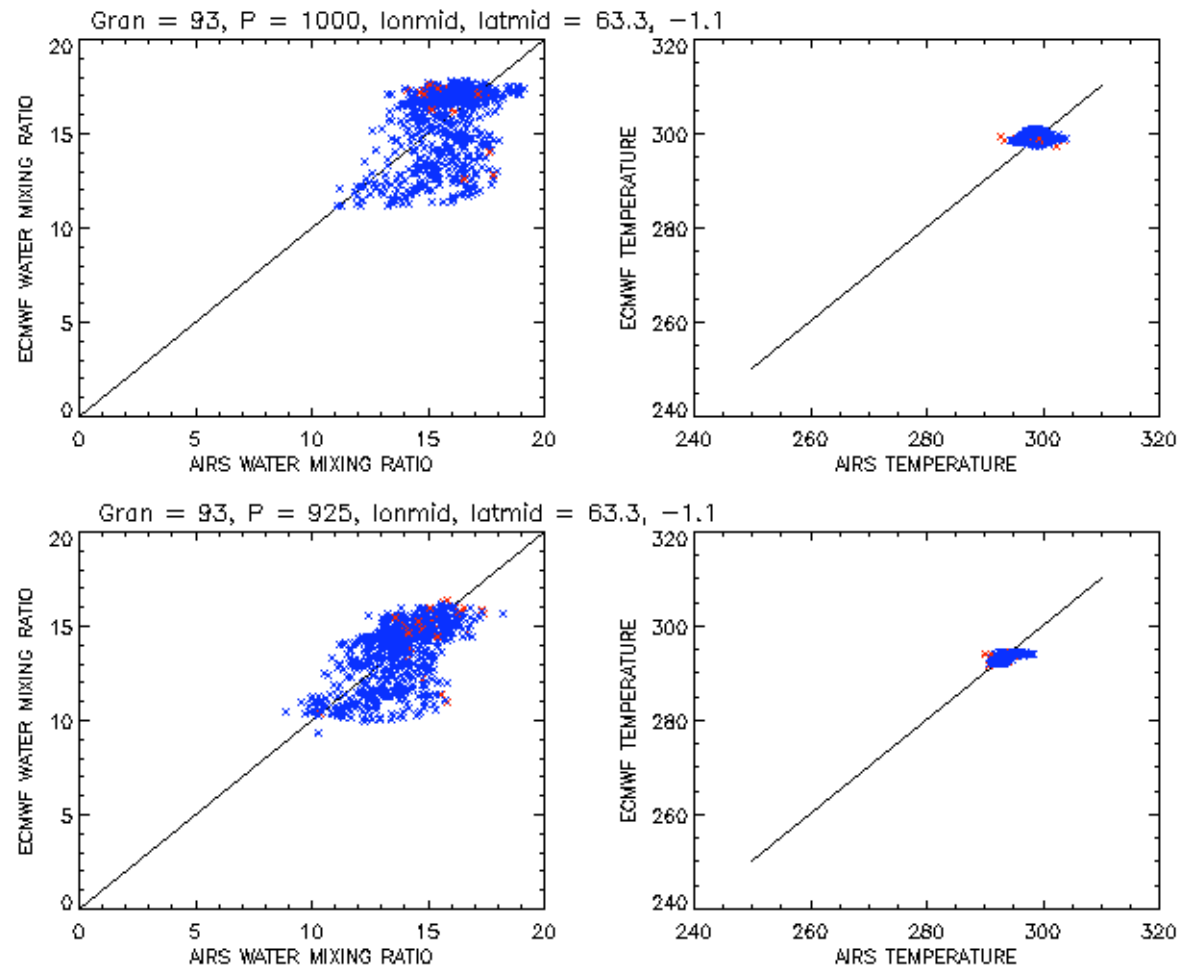
South of Africa!

## Regime 2: Moist Tropics



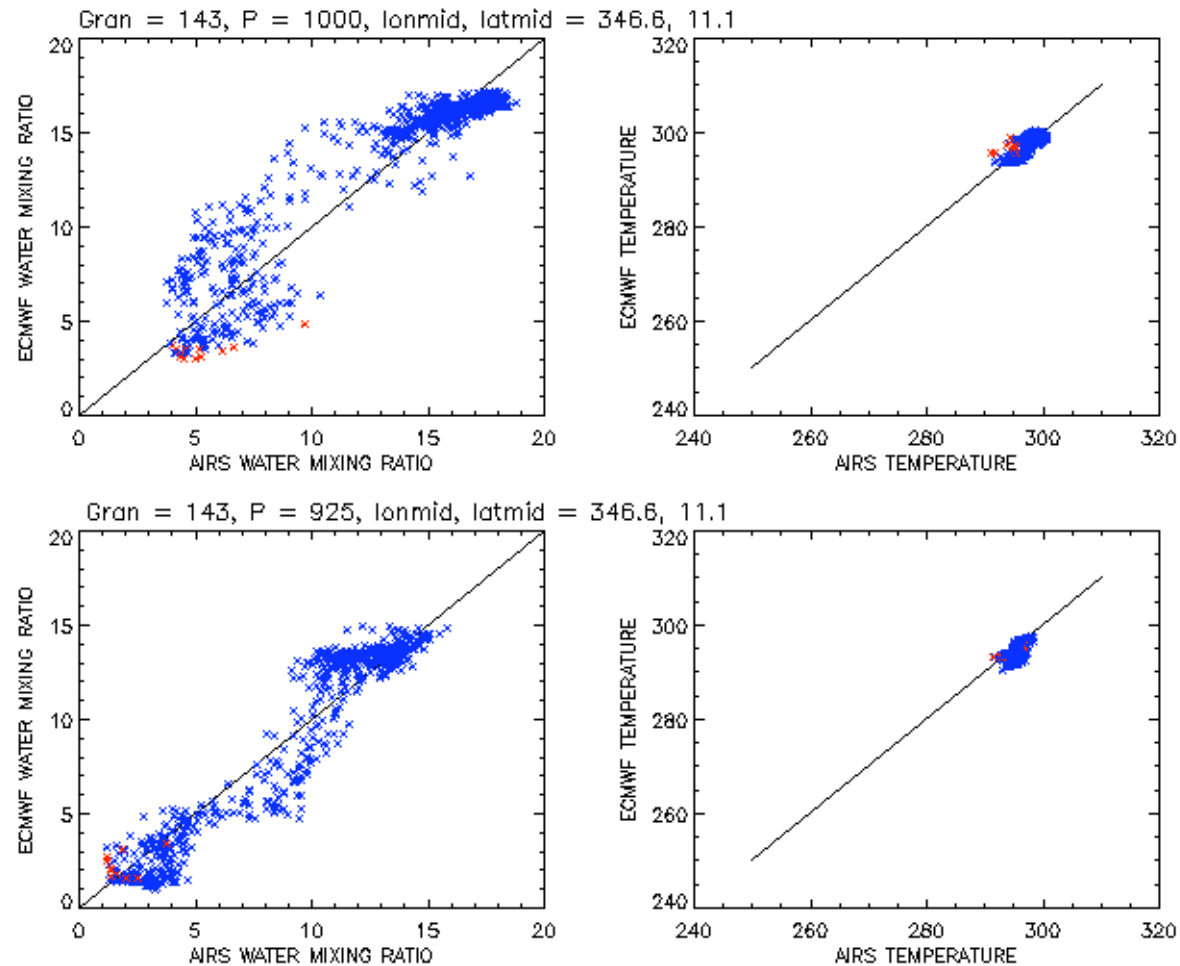
Tropical Western Pacific

## More Moist Tropics



Tropical Indian Ocean

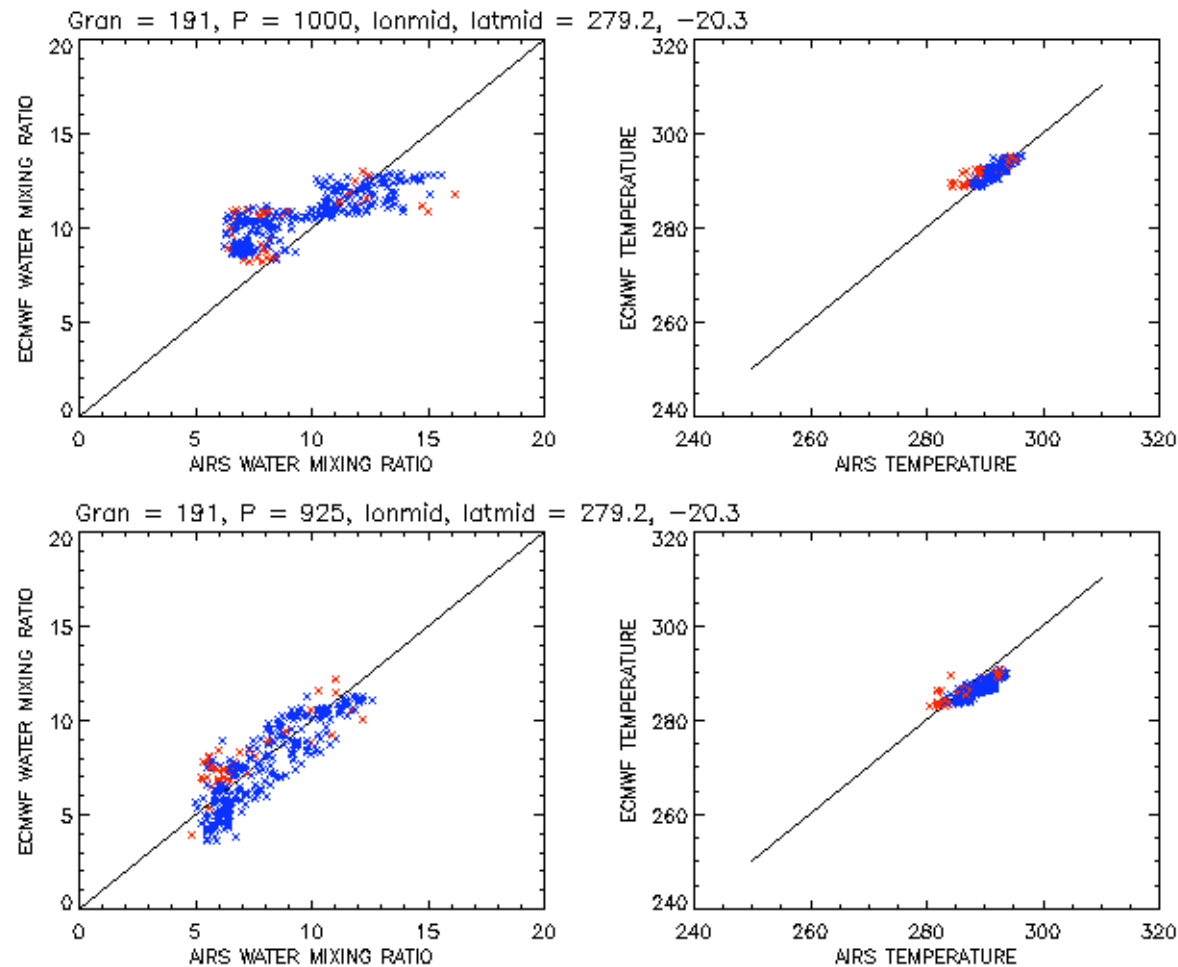
## Regime 3: Stratus Zones



West of Africa



## More Stratus Zones



West of South America

## Conclusions About Granule Scatterplots

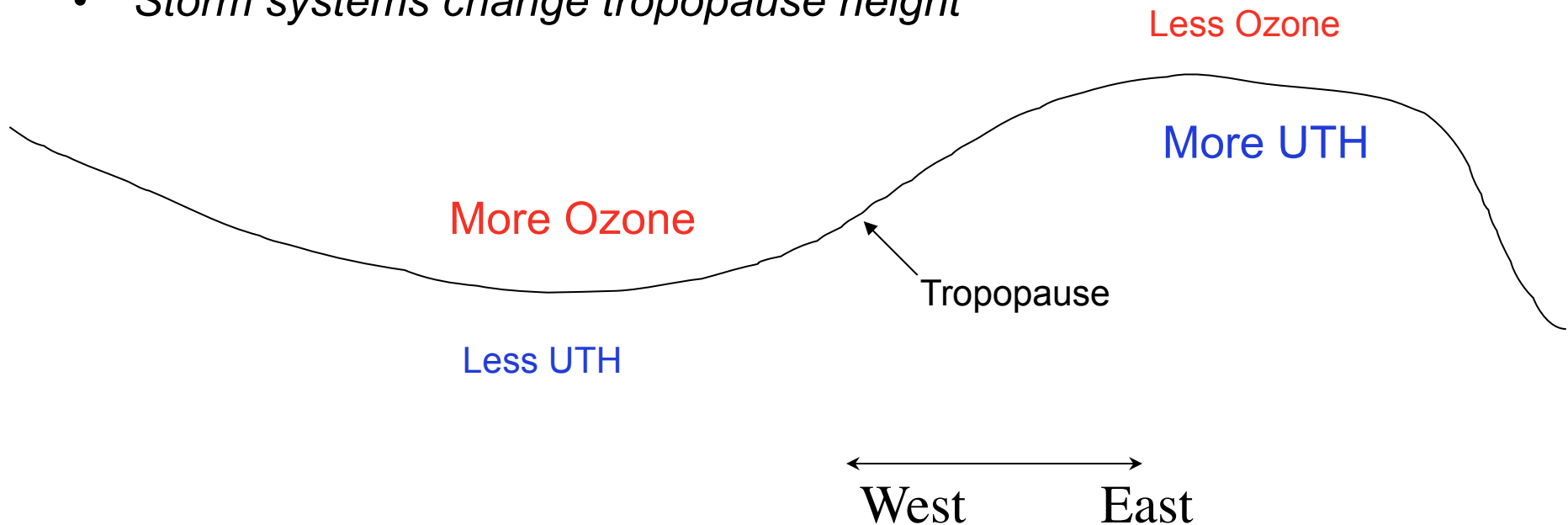
- Certain weather regimes predominate
- Understanding these should lead to more definitive internal indicators of retrieval quality.

## NEXT: Upper Tropospheric Humidity and Ozone

### Physical Consistency in AIRS Products:

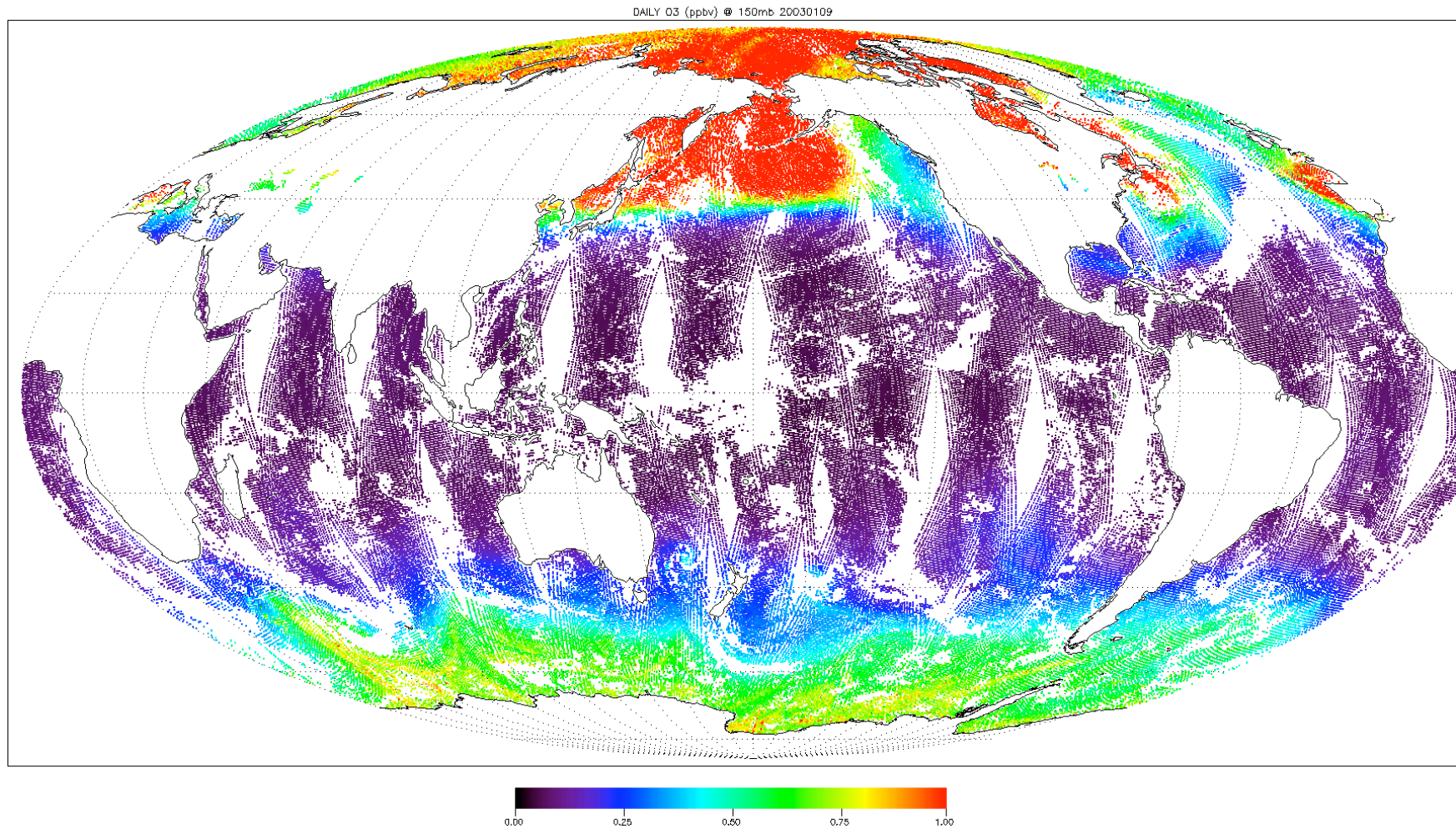
*First noted by collaborator Andrew Gettelman of NCAR*

- The Basic Principle: Ozone and UTH are *anticorrelated* because they are separated by the tropopause
- *Storm systems change tropopause height*



# 150 mb Ozone, January 2, 2003

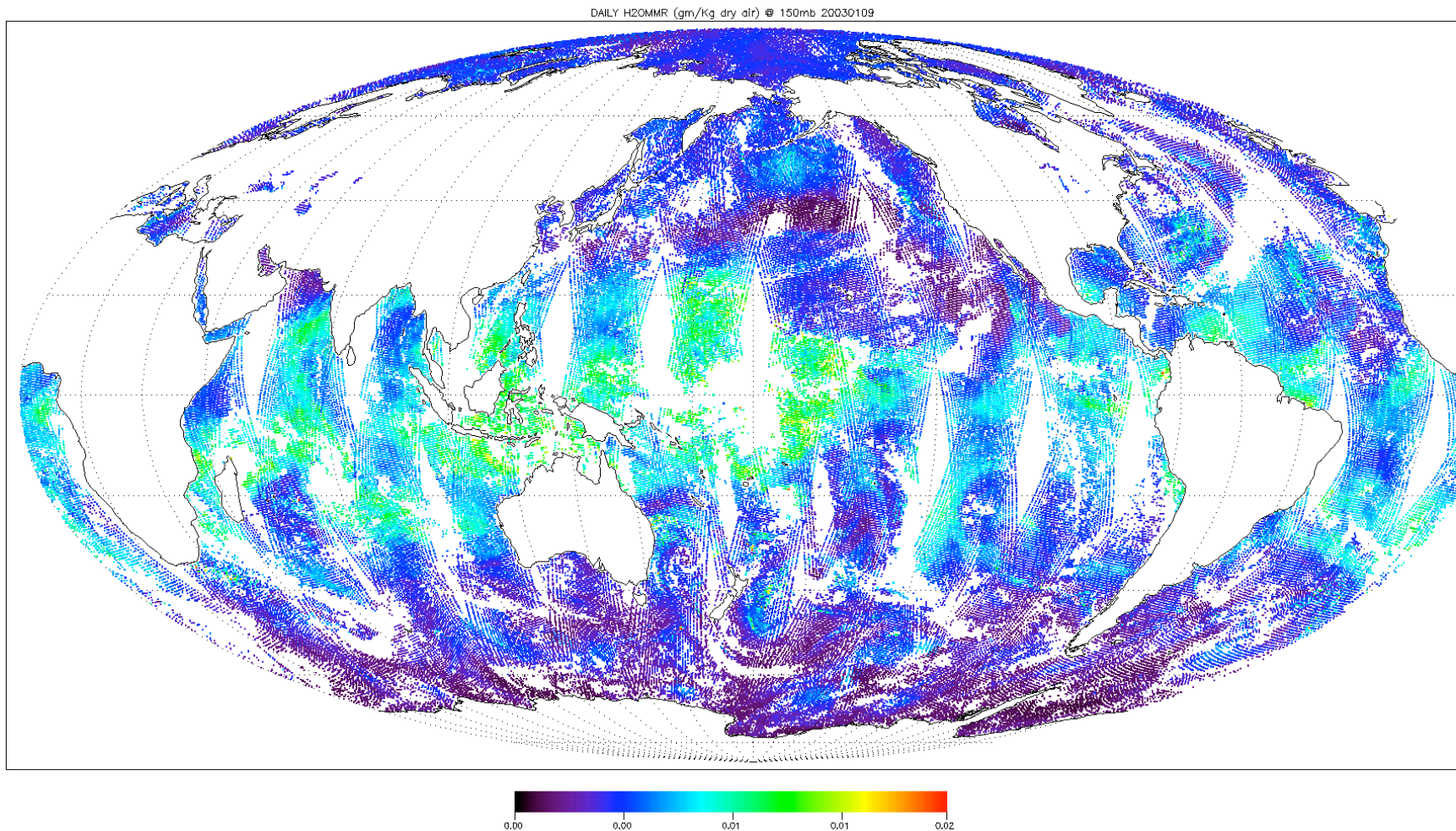
## Note Highest Values in North and South Pacific





# 150 mb Water Vapor, January 2, 2003

## Note LOW Values in North and South Pacific



## Summaries of the Latest Validation Results

- Title are welcome for a Topical Collection in JGR-Atmospheres
- A number of indicators show AIRS is producing high quality retrievals
  - Remarkable agreement between AIRS and NCEP in mean temperatures in the equatorial troposphere.
  - Weak dependence of inferred SST on cloud top temperature.
  - Global agreement with ECMWF in T for several climate regimes; further study need to understand q.
  - Agreement between 150 mb humidity and ozone